CLAIMS

What is claimed is:

1. A baffle for use in heating and mixing a feed material within a retort, the baffle comprising:

an elongated body having a top surface and an opposing bottom surface, at least a portion of the top surface having an inverted substantially V-shape configuration; and

means mounted at least partially on, within, or directly adjacent to the elongated body for selectively heating the elongated body.

2. A baffle as recited in claim 1, wherein the bottom surface at least partially bounds a collection channel adapted to collect gases or vapors.

3. A baffle as recited in claim 2, wherein the bottom surface has an inverted substantially U- or V-shaped transverse cross section that at least partially bounds the collection channel.

4. A baffle as recited in claim 1, wherein the top surface comprises a substantially planar first side face and a substantially planar second side face that are disposed in diverging planes.

5. A baffle as recited in claim 4, wherein at least the first side face or the second side face is disposed in a plane having an inside angle relative to the horizontal in a range between about 40° to about 80°.

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6. A baffle as recited in claim 4, wherein the first side face and the second side face form an inside angle in a range between about 1° to about 70°.

7. A baffle as recited in claim 4, wherein a vertical plane extends through the body along the length thereof, a first inside angle formed between the first side face and the vertical plane being different than a second inside angle formed between the second side face and the vertical plane.

8. A baffle as recited in claim 1, wherein the top surface having the inverted substantially V-shape configuration terminates at an apex, the apex having a radius of curvature less than about 20 mm.

9. A baffle as recited in claim 1, wherein the top surface having the inverted substantially V-shape terminates at an apex, the apex having a radius of curvature less than about 5 mm.

10. A baffle as recited in claim 1, wherein the top surface comprises an upper portion which includes the inverted substantially V-shape configuration and a lower portion that slopes or curves away from the upper portion.

11. A baffle as recited in claim 1, wherein the baffle is comprised of a material capable of withstanding a temperature of at least 500° C.

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12. A baffle as recited in claim 1, wherein the means for selectively heating comprises at least one electrical heating filament mounted at least partially on, within, or directly adjacent the body.

13. A baffle as recited in claim 1, wherein the body is tubular and has an interior surface bounding a chamber.

14. A baffle as recited in claim 13, wherein the means for selectively heating comprises a secondary body removably disposed within the tubular body.

15. A baffle as recited in claim 14, wherein the tubular body comprises a top wall on which the top surface is formed and an opposing bottom wall on which the bottom surface is formed, the secondary body being disposed within the chamber of the tubular body so that the secondary body biases against the top wall of the tubular body and the secondary body is spaced apart from the bottom wall of the tubular body.

16. A baffle as recited in claim 14, wherein an electrical heating filament is mounted on the secondary body.

17. A baffle as recited in claim 1, wherein the body is comprised of a plurality of interconnected sections.

18. A baffle as recited in claim 1, wherein the body has a first end and an opposing second end, an insulation plug being mounted to the first end of the body.

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19. A baffle as recited in claim 18, wherein the body is comprised of a metal and the insulation plug is comprised of a refractory material.

20. A baffle as recited in claim 1, wherein the top surface of the body is comprised of a first material and the bottom surface of the body is comprised of a second material, the second material being different than the first material such that when the body is heated, the bottom surface is cooler than the top surface.

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21. A retort heating apparatus for processing feed material, the retort heating apparatus comprising:

a heating chamber bounded at least in part by a side wall, the side wall having a plurality of horizontally and vertically spaced apart apertures formed thereon so as to provide fluid communication through the side wall;

a plurality of vertically and horizontally spaced apart baffles at least partially disposed within the heating chamber, each baffle comprising an elongated body having a top surface, at least a portion of the top surface having an inverted substantially V-shape configuration; and

a plurality of collection channels disposed within the heating chamber, each collection channel being aligned with a corresponding aperture, the collection channels being adapted to collect vapors and channel the vapors to the corresponding apertures.

22. A retort heating apparatus as recited in claim 21, wherein the portion of the top surface having the inverted substantially V-shape configuration comprises a substantially planar first side face and a substantially planar second side face that are disposed in diverging planes.

23. A retort heating apparatus as recited in claim 22, wherein the first side face and the second side face form an inside angle in a range between about 1° to about 70°.

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24. A retort heating apparatus as recited in claim 21, wherein the top surface having an inverted substantially V-shape configuration terminates at an apex, the apex having a radius of curvature less than twice a maximum diameter of the feed material passing through the heating chamber.

25. A retort heating apparatus as recited in claim 21, wherein the top surface having an inverted substantially V-shape configuration terminates at an apex, the apex having a radius of curvature less than about 10 mm.

26. A retort heating apparatus as recited in claim 21, wherein the plurality of baffles are disposed in a plurality of vertically spaced apart rows, adjacent rows being horizontally staggered relative to each other.

27. A retort heating apparatus as recited in claim 21, wherein each body has a bottom surface, the bottom surface of at least a portion of the baffles at least partially bounding a corresponding collection channel.

28. A retort heating apparatus as recited in claim 21, further comprising means for heating the feed material within the heating chamber.

29. A retort heating apparatus as recited in claim 28, wherein the means for heating the feed material within the heating chamber comprises an electrical heating filament at least partially disposed on, within, or directly adjacent to each baffle.

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30. A retort heating apparatus as recited in claim 21, further comprising a vapor chamber formed adjacent to the heating chamber, each aperture in the side wall providing fluid communication between the heating chamber and the vapor chamber.

31. A retort heating apparatus as recited in claim 30, further comprising:

a collection plate disposed within the vapor chamber at a downwardly curved or sloped orientation, the collection plate having lower end disposed adjacent to the side wall and an opposing upper end disposed away from the side wall; and

a return slot formed through the side wall at or adjacent to the lower end of the collection plate, the return slot providing fluid communication between the heating chamber and the vapor chamber.

32. A retort heating apparatus as recited in claim 30, wherein the vapor chamber is bounded above by a first downwardly sloping collection plate and the vapor chamber is bounded below by a second downwardly sloping collection plate.

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33. A retort heating apparatus for processing feed material, the retort heating apparatus comprising:

a heating chamber bounded at least in part by a side wall;

a plurality of vertically and horizontally spaced apart baffles at least partially disposed within the heating chamber, each baffle comprising an elongated body having a top surface, at least a portion of the top surface comprising a substantially planar first side face and a substantially planar second side face that are disposed in diverging planes; and

means for heating the feed material within the heating chamber.

34. A retort heating apparatus as recited in claim 34, wherein the top surface of each body includes an elongated narrow ridge disposed between the first side face and the second side face.

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35. A retort heating apparatus for processing a feed material, the retort heating apparatus comprising:

a heating chamber bounded at least in part by a side wall;

a plurality of baffles at least partially disposed within the heating chamber, each baffle comprising an elongated body having a top surface, at least a portion of the top surface being arched, the plurality of baffles being vertically and horizontally spaced apart so that substantially all of the feed material that vertically passes through the heating chamber is horizontally displaced as the feed material passes by the baffles; and

means for heating the feed material within the heating chamber.

36. A retort heating apparatus as recited in claim 35, wherein the portion of the top surface being arched has an inverted substantially U- or V-shape configuration.

37. A retort heating apparatus as recited in claim 35, further comprising means for feeding the feed material into the heating chamber while preventing the free flow of air into the heating chamber.

38. A retort heating apparatus as recited in claim 35, further comprising a plurality of apertures extending through the side wall.

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39. A retort heating apparatus as recited in claim 38, wherein the body of each baffle has a bottom surface, the bottom surface of at least a portion of the baffles at least partially bounding a collection channel, each collection channel communication with a corresponding aperture.

40. A retort heating apparatus as recited in claim 38, further comprising a vapor chamber formed on a side of the side wall opposite the heating chamber, each aperture in the side wall providing fluid communication between the heating chamber and the vapor chamber.

41. A retort heating apparatus as recited in claim 40, further comprising:

a collection plate disposed within the vapor chamber at a downwardly curved or sloped orientation, the collection plate having a lower end disposed adjacent to the side wall and an opposing upper end disposed away from the side wall; and

a return slot formed through the side wall at or adjacent to the lower end of the collection plate, the return slot providing fluid communication between the heating chamber and the vapor chamber.

42. A retort heating apparatus as recited in claim 35, wherein each body is tubular and has an interior surface bounding a chamber.

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43. A retort heating apparatus as recited in claim 35, wherein the means for heating the feed material comprises a secondary body removably disposed within the tubular body.

44. A retort heating apparatus as recited in claim 35, wherein the means for heating the feed material comprises at least one electrical heating filament disposed at least partially on, within or directly adjacent to each body.

45. A retort heating apparatus as recited in claim 35, wherein the plurality of baffles are disposed in a plurality of vertically stacked rows, each row being horizontally staggered relative to the adjacent vertical row.

46. A retort heating apparatus as recited in claim 35, wherein for a select body the top surface is comprised of a first material and the bottom surface is comprised of a second material different than the first material such that when the body is heated, the bottom surface is cooler than the top surface.

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47. A retort heating apparatus as recited in claim 39, further comprising a gas jet aligned with a collection channel of a select baffle.

48. A retort heating apparatus as recited in claim 35, wherein the plurality of baffles each have a common maximum width, the plurality of baffles comprising:

a first row of the baffles each horizontally separated by a first distance substantially equal to the common maximum width; and

a second row of the baffles vertically separated from the first row by a second distance, each baffle of the second row being centrally disposed midway between corresponding baffles of the first row.

49. A retort heating apparatus as recited in claim 48, wherein the maximum width of the baffles is in a range between about 5 cm to about 15 cm.

50. A retort heating apparatus as recited in claim 48, wherein the second distance is in a range between about 5 cm to about 10 cm.

51. A retort heating apparatus as recited in claim 35, further comprising a plurality of vertically stacked modular units, each modular unit having a perimeter wall that bounds a portion of the heating chamber, the perimeter wall of each modular unit also comprising a portion of the first wall and the second wall.

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52. A method for processing a feed material, the method comprising:

passing a feed material down through a heating chamber of a retort, the heating chamber having a plurality of vertically and horizontally spaced apart baffles disposed therein;

heating the baffles such that as the feed material passes down through the heating chamber the feed material is heated so as to emit an oil vapor, the oil vapor rising within the heating chamber and entering into one of a plurality of collection channels;

gathering the oil vapor from the collection channels; and

condensing the oil vapor into an oil.

53. A method as recited in claim 52, further comprising separating the feed material by size prior to passing the feed material into the heating chamber so that the feed material has a maximum diameter in a range between about 2 mm to about 10 mm.

54. A method as recited in claim 52, further comprising washing the feed material prior to passing the feed material into the heating chamber.

55. A method as recited in claim 54, wherein the feed material is washed so as to remove at least a portion of the minerals within the feed material, thereby increasing the porosity of feed material.

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56. A method as recited in claim 52, further comprising drying the feed material so that the water content of the feed material is reduced to less than at least 5% of the total weight of feed material and water.

57. A method as recited in claim 52, further comprising heating the feed material to a temperature of at least 100° C prior to passing a feed material down through the heating chamber of the retort.

58. A method as recited in claim 52, wherein the oil vapor emitted from the feed material comprises a plurality of different types of oil vapor, the act of gathering comprising gathering the oil vapor into a plurality of discrete oil vapor streams, each oil vapor stream comprising at least 60% of one of the different types of oil vapors.

59. A method as recited in claim 58, wherein the different type of oil vapors comprise light naphthalene, heavy naphthalene, light kerosene, heavy kerosene, light diesel, heavy diesel and residual gas.

60. A method as recited in claim 58, further comprising separately condensing each of the different oil vapor streams.

61. A method as recited in claim 58, wherein each collection channel is formed on a bottom side of a corresponding baffle.

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62. A method for processing a feed material, the method comprising:

passing a feed material down through a heating chamber of a retort, the heating chamber having a plurality of vertically and horizontally spaced apart baffles disposed therein such that substantially all of the feed material that vertically passes down through the heating chamber is horizontally displaced as the feed material passes by the baffles;

heating the feed material within the heating chamber such that the feed material emits an oil vapor;

collecting the oil vapor from within the heating chamber; and

condensing the oil vapor into an oil.

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